Resources for Solving Problems

Theodore Hodapp
American Physical Society
Director of Project Development
Senior Advisor: Education and Diversity
Goal: Increase the number of highly qualified high school physics teachers; Build a national coalition of universities engaged in this work.


Contact: Monica Plisch, plisch@aps.org

Support: NSF-0108787, 0808790, 1646913, 1707990

URL: www.phystec.org
URM Bachelor and PhD STEM Degrees

<table>
<thead>
<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>78</td>
<td>63</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>639</td>
<td>61</td>
</tr>
<tr>
<td>Chemistry</td>
<td>161</td>
<td>386</td>
</tr>
<tr>
<td>Engineering</td>
<td>639</td>
<td>161</td>
</tr>
<tr>
<td>Mathematics and Statistics</td>
<td>678</td>
<td>639</td>
</tr>
<tr>
<td>Physics</td>
<td>78</td>
<td>63</td>
</tr>
<tr>
<td>Astronomy</td>
<td>61</td>
<td>6</td>
</tr>
</tbody>
</table>

Percentage of URM
Physics GRE "Correlation" with Grad GPA

$r = 0.24; \text{ } N = 1686$

“Weak” Correlation
**APS Bridge Program**

**Goal:** Increase the number of underrepresented (URM) students earning a PhD in physics or astrophysics

**Strategy:** Collect applications from URM students not admitted, and make available to departments. Provide best-practices in admissions, mentoring, retention and support (Meeting: Nov 2018, Google/Stanford)

**Contact:** Erika Brown, brown@aps.org

**URL:** www.apsbridgeprogram.org

**Support:** NSF-0958333, 1143070

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**PhDs reach same fraction as undergrad degrees**

<table>
<thead>
<tr>
<th>Year</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>10</td>
</tr>
<tr>
<td>2014</td>
<td>15</td>
</tr>
<tr>
<td>2015</td>
<td>20</td>
</tr>
<tr>
<td>2016</td>
<td>25</td>
</tr>
<tr>
<td>2017</td>
<td>30</td>
</tr>
</tbody>
</table>

**Left Program**

**Placed/Retained**

**Project Funding**

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APS Conferences for Undergraduate Women in Physics (CUWiP)

**Goal:** Three-day regional conferences for undergraduate physics majors, to help women continue in physics by providing them with information about graduate school, professional career advice, and networking opportunities with other women in physics (Next events: 18-20 Jan 2019)

**Contact:** Brián Clash, women@aps.org

**Support:** NSF: 1346627, 1622510; DOE: DE-SC0011076

**URL:** www.aps.org/cuwip
STEP UP 4 Women

1

High School  College Entrance  BS (degree)  PhD (degree)  Assistant Professor

2

High School  College Entrance  BS (degree)  PhD (degree)  Assistant Professor

3

High School  College Entrance  BS (degree)  PhD (degree)  Assistant Professor
STEP UP 4 Women

Sources: NCES/IPEDS, AIP-SRC, HERI

Bar chart showing the percentage of women at different stages of education.

- High School: 50%
- College Entrance: 30%
- BS (degree): 25%
- PhD (degree): 20%
- Assistant Professor: 15%

www.aps.org
**STEP UP 4 Women**

**Goal:** Close the gender gap in undergraduate physics degrees

**Strategy:** Enlist large numbers of high school physics teachers to directly recruit women to pursue a physics degree

**Contact:** Kathryne Sparks Woodle, woodle@aps.org

**Support:** NSF: 1720810, 1720869, 1720917, 1721021

**URL:** www.stepup4women.org

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**Participation of Women in Physics**

<table>
<thead>
<tr>
<th>Country</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>70%</td>
</tr>
<tr>
<td>USA</td>
<td>60%</td>
</tr>
<tr>
<td>Canada</td>
<td>50%</td>
</tr>
<tr>
<td>Australia</td>
<td>40%</td>
</tr>
<tr>
<td>Italy</td>
<td>30%</td>
</tr>
<tr>
<td>Argentina</td>
<td>20%</td>
</tr>
<tr>
<td>India</td>
<td>10%</td>
</tr>
<tr>
<td>Albania</td>
<td>5%</td>
</tr>
<tr>
<td>Iran</td>
<td>0%</td>
</tr>
</tbody>
</table>

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www.aps.org
Society of Physics Students

**Goal:** Support the professional development of undergraduate physics majors

**Strategy:** Sigma Pi Sigma – the physics honor society; leadership opportunities; department cohesion; scholarships; internships; outreach awards; undergrad research; conferences

**Strategy:** Careers Toolbox

**Contact:** Brad Conrad, bconrad@aip.org

**URL:** www.spsnational.org
Public Outreach

**Goal:** Build excitement in populations beyond the physics/astronomy community for physics and science

**Strategy:** Mini-grants for outreach ($10,000); comic books, posters, and science kits for middle school classrooms (PhysicsQuest); blogs and social media posts on “cool” science

**Contact:** Becky Thompson, thompson@aps.org

**URL:** www.physicscentral.org
**Goal:** Increase the number of African American, Hispanic American, and Native American undergraduates obtaining physics bachelor’s degrees

**Strategy:** Connect students with local faculty mentors and provide support and resources. Emergency financial aid fund to mentees (BEAM Fund). National recognition of mentoring service (coming).

**Contact:** Monica Plisch nmc@aps.org

**URL:** www.aps.org/nmc
Grad School Shopper

Goal: Provide information on physics / astronomy graduate programs
Strategy: Online resource with data, and comparisons
Contact: Yolanda Matthews, ymatthews@aip.org
URL: gradschoolshopper.com
Physics InSight Slideshow

**Goal:** Provide a careers-oriented hallway slideshow for recruitment

**Strategy:** Slideshow comes out ~2x/semester and features profiles of physicists in industry, national labs, and other non-academic (mostly) careers; focus on individuals without PhDs (students already get information on academic careers); editable to include local information; hundreds of slides available

**Contact:** Crystal Bailey, bailey@aps.org

**URL:** www.aps.org/careers/insight
Goal: Provide best-practice advice on topics relevant to improving and supporting physics departments

**SPIN-UP:** Increase number of majors –
www.aps.org/programs/education/undergrad/faculty/spinup/spinup-report.cfm

**T-TEP:** Improve teacher education –
www.phystec.org/webdocs/TaskForce.cfm

**Phys21:** Enhance career readiness of majors –
www.compadre.org/Phys21

**LGBT+:** Improve climate for LGBT physicists –
www.aps.org/programs/lgbt/

**GradEd:** Improve graduate education –
www.aps.org/programs/education/graduate/conf2013/report.cfm
APS Policy Statements

**Goal:** Advocate for physicists, and the broader community

**Topics:**
- **Education**
- Ethics and Values
- Human Rights
- Internal Policy
- National Policy

**Education Topics:**
- Undergraduate Research Statement
- K-12 Education Statement
- Career Options for Physicists
- Advocacy for Science Education
- Improving Education for Professional Ethics, Standards and Practices
- Assessment and Science
- Research in Physics Education

**URL:** [www.aps.org/policy/statements](http://www.aps.org/policy/statements)

Coming soon: Physics GRE, Ethics
**Goal:** Provide data to help faculty and departments understand the national picture and make comparisons

**AIP SRC:** Comprehensive data on faculty, students, careers, and diversity – [www.aip.org/statistics](http://www.aip.org/statistics)

**APS:** Graphics, data, and presentation-ready slides using national sources to inform departments on students, women, minorities, and trends; comparison tool to rank your department – [www.aps.org/programs/education/statistics](http://www.aps.org/programs/education/statistics)
Portal: Introductory Physics for the Life Sciences

**Goal:** Transformative web site for sharing, testing, and disseminating materials for IPLS and related courses. Being developed by AAPT and eight colleges and universities. Up and running by mid-2018

**Contact:** Bob Hilborn, rhilborn@aapt.org

**URL:** www.compadre.org/ipls/

**Support:** NSF: 1624185
Partnership for Integrating Computation into UG Physics

**Goal:** Survey of the current usage of computational work in undergraduate physics programs (report available early 2017). Annual Computational Physics Faculty Development Workshop. Computational Physics workshops at AAPT section meetings, and APS and AAPT national meetings

**Contact:** Bob Hilborn, rhilborn@aapt.org

**URL:** www.compadre.org/picup

**Support:** NSF: 1432363, 1524963, 1505278
Physics Research
Mentor Training Seminar

Goal: Help research mentors improve their mentoring skills

Strategy: Provide a guidebook and materials to facilitate a 10-week seminar for physics researchers. Includes guidance on how to run workshops, directed readings, and strategy tips

Contact: Monica Plisch, plisch@aps.org

URL: www.aps.org/link/mentor-training
Council on Undergraduate Research

**Goal:** Advocating for faculty’s role in providing undergraduate research opportunities for students

**Strategy:** Develop faculty networks, develop tools and resources that support faculty, assess impact of undergraduate research, advocate and pilot new ways to engage students in research

**Contact:** Terry Oswalt (ERAU), terry.oswalt@erau.edu

**URL:** www.cur.org
**Goal:** Enable women in physics and astronomy departments (particularly those who are isolated) to create their own eAlliance, a peer mentoring group of other women physicists or astronomers who share similar characteristics.

**Contact:** eAlliances@aapt.org

**URL:** ealliances.aapt.org

**Support:** NSF: 1500529
Professional Skills Development Workshops

**Goal:** Improve the negotiation and communication skills for women

**Strategy:** 1-day workshop at national APS meetings; facilitation by nationally recognized leaders in negotiation and communication strategies

**Contact:** Brián Clash, women@aps.org

**Support:** NSF-0347210, 0752540, 1012585, 1419913

**URL:** www.womeninphysics.org
CSWP Site Visits to Improve the Climate for Women and Minorities

**Goal:** Improve the climate for underrepresented individuals in physics departments

**Strategy:** 1-2 day site visits resulting in a formal report to the chair; 1-year follow up; focus on Research Universities, National Laboratories, Scientific Collaborations; 79 visits over last 25 years; best-practices in hiring, retention, climate, etc. available on the website; led by the APS Committee on the Status of Women in Physics (CSWP) and APS Committee on Minorities (COM)

**Contact:** Brián Clash, women@aps.org

**URL:** www.womeninphysics.org
Women in Physics Groups

**Goal:** Improve recruitment and/or retention of women in physics (WiP)

**Strategy:** Provide mini-grants (up to $1,000) to build, improve, or sustain WiP groups; collect and share ideas on activities

**Examples:** Workshops on careers, communication, negotiation, leadership, dealing with bias, other skills; high school or middle school classroom visits; lab tours or field trips; research expos; book club or journal club; group lunches, dinners, or social events

**Contact:** Brián Clash, women@aps.org

**URL:** www.womeninphysics.org
Goal: Develop a working document to guide departmental review, assessment, and improvement

Strategy: National task force to design, write, vet, and disseminate a collection of effective practices and guide for self-assessment, along with its inherent review structure to improve undergraduate physics. Although not accreditation at this time, it will form the basis of a document that could be used in this fashion; first sections likely to come out this spring with the full guide released in early 2019.

Contact: Theodore Hodapp, hodapp@aps.org

Support: American Physical Society, NSF: 1738311, 1747563
EP3: Tentative Section List

- Capstone experiences
- **Career preparation**
- Communications skills
- Computational skills
- Departmental climate
- Equity, diversity, and inclusion
- Ethics
- **Learning spaces and facilities**
- Faculty development
- Implementing research-based instructional practices
- Individualized degree tracks
- Institutional partnerships: dual-degree physics / engineering programs
- Internships
- Introductory Physics for Life Sciences
- Introductory STEM major courses
- Laboratory / experimental skills
- **Learning assistants**
- Mentoring / advising
- Non-STEM major courses
- Online education
- Community Engagement and Outreach
- **Recruiting**
- **Retention**
- **Teacher preparation programs**
- **Undergraduate research**
- Upper-level physics courses

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Hints for the Future

• Understand the problems of the people “up the chain” (chair, dean, provost, etc.), and solve their problems – this will allow you to gain resources to solve your problems.

• Keep leadership informed about your progress relatively often – do not ask for resources when you do this; this develops a relationship and your credibility for the time when you do need resources.

• Don’t go “around” your leaders (chair, dean, etc.), but don’t let a negative response stop you – regroup, or be patient.

• Involve your students – they have intrinsic knowledge of context.

• Ask for help: mentors, chair, other faculty in or out of department.